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(54) **Soundproof type water-cooled engine generator**

Schallgedämpfte Anlage für wassergekühlte Brennkraftmaschine mit Stromgenerator

Dispositif d'insonorisation pour un moteur à combustion refroidi par eau entraînant un générateur de courant

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Description

BACKGROUND OF THE INVENTION

Field of the Invention

The present invention relates to a soundproof type water-cooled engine generator which provides such a low-noise structure as improving soundproof performance and cooling efficiency.

Description of the Related Art

The conventional cooling structure for this kind of soundproof type water-cooled engine generator, as shown in Fig. 3, includes a water-cooled engine 41, a generator 42, and a soundproof bonnet 43. The water-cooled engine 41 is directly connected to the generator 42 so that they keep their axes aligned. The water-cooled engine 41 and the generator 42 are accommodated in the soundproof bonnet 43. Air inlets 44, 44, 44 are formed on the side wall of the bonnet 43. Those inlets are located close to the generator accommodated in the soundproof bonnet 43. On the opposite side of the water-cooled engine 41 to the generator 42, an engine fan 45 is supported on a shaft contained in the water-cooled engine 41 so that the engine fan 45 is rotated by the engine 41. As opposed to the engine fan 45, a radiator 46 is located. The engine fan 45 is surrounded by an encircling wall 47.

In operation, the engine fan 45 is driven to take air, that is, cooling air from the air inlets 44 to the soundproof bonnet 43. The cooling air is taken inside to cool the generator 42, the water-cooled engine 41, and then the other units such as a battery and a control unit. Then, the air is introduced to an exhaust duct 48 for cooling a muffler located upwardly of the exhaust duct 48. The air is then discharged outside through an exhaust outlet 50. The exhaust duct 48 is formed by partitioning the soundproof bonnet 43 from the shroud chamber where the water-cooled engine 41, the generator 42 and the control unit are held.

Further, another soundproofing and cooling technique has been provided. In this technique, a shroud chamber is independently provided in the exhaust duct 48. A radiator is slopewise located in the front lower portion of a cooling fan provided in the shroud chamber so that the engine fan is spaced from the radiator by a predetermined interval for diminishing a current noise occurring in this radiator.

In the foregoing structure where the radiator is located as opposed to the engine fan, the engine fan is located close to the radiator. Hence, the current noise caused when the cooling current of air given by the engine fan passes through a radiator core is made so large that the noise is guided out of the exhaust outlet through the exhaust duct. The noise guided outside sounds as a large uncomfortable sound around the structure. In particular, such a large sound annoys residents in an apartment house when the engine fan is operated at night.

Moreover, to meet the market demands, the soundproof bonnet is requested to be reduced in size. This leads to reducing the lengthwise dimension of the structure. However, if the front dimension of the radiator is made shorter as keeping the conventional structure, disadvantageously, the resistance against the exhaust current of air is made so large that the cooling performance does not reach the satisfactory level.

As another disadvantage, since the muffler is located upwardly of the exhaust duct without any cover, the muffler serves to directly apply heat to the radiator, thereby lowering the cooling efficiency of the radiator.

In the aforementioned structure where the shroud chamber is independently provided in the outlet of the engine fan and the radiator is simply inclined, the following disadvantages take place. At first, water is reserved in the lower portion than a drain so that water is not allowed to be completely drained out of the radiator. Hence, the radiator holds the air reservoir in the top portion so that the water flow in the radiator is made slow. Second, since the radiator is slopewise located downwardly of the shroud chamber, dirt and oil are likely to adhere to the surface of the radiator core. Third, since the radiator provides its cap in the top, the user needs to take a troublesome operation of pouring water in the radiator.

SUMMARY OF THE INVENTION

It is an object of the present invention to provide a soundproof type water-cooled engine generator which includes such a low-noise structure as improving soundproof performance and cooling performance.

To achieve the foregoing object, a soundproof type water-cooled engine generator having a water-cooled engine, a generator to be driven by the water-cooled engine, and a soundproof bonnet accommodating the engine and the generator and arranged so that a cooling fan generates a cooling current of air passing around the cooling engine and the generator and exhausting to the outside through a radiator and around a muffler, provides an engine and generator chamber for accommodating the engine and the generator, the chamber provided in the soundproof bonnet; an exhaust processing chamber for accommodating the radiator and the muffler, the chamber provided in the soundproof bonnet; a panel wall having an air vent for a cooling current of air generated by the cooling fan and partitioning the engine and generator chamber from the exhaust processing chamber; a radiator provided to keep a predetermined angle with the panel wall in order to disallow the cooling current of air passing through the air vent to collide with the radiator; a shroud chamber having a ventilation path formed to guide the cooling current of air from the air vent to the radiator, the shroud chamber provided in the

exhaust processing chamber; and a muffler provided to pass the cooling current of air from the radiator around the muffler itself, the muffler provided in the exhaust processing shroud chamber.

In the aforementioned arrangement, the rotation of the cooling fan causes the atmosphere to be flown from an air inlet formed on the side wall to the engine and generator chamber for cooling the generator and the water-cooled engine. The air is sent to the L-like shroud chamber independently provided in the exhaust processing chamber. Then, the air is passed to the radiator located on the lateral side and exhausted out of the chamber. The exhaust current is directed lower between the outer surface of the shroud chamber and the inner surface of the exhaust processing chamber for cooling the muffler located in the lower of the exhaust processing chamber. The exhaust current streams along the peripheral surface of the muffler and the muffler pipe. The resulting heated air is discharged through the exhaust duct provided on the ceiling of the exhaust processing chamber. The noises occurring in the engine and generator chamber are shielded by the panel wall. The exhaust current brings the noises into the shroud chamber. The noises are temporarily cut off by the shroud chamber and the radiator independently provided in the exhaust processing chamber. Besides, the current of air is got out of the ceiling through the muffler provided in the lower portion of the shroud chamber and the exhaust duct. Hence, a lot of obstacles serve to diminish the noises leaked to the outside.

BRIEF DESCRIPTION OF THE DRAWINGS

Fig. 1 is a perspective view showing a low-noise structure of a soundproof type water-cooled engine generator according to an embodiment of the present invention;

Fig. 2A is an elevation showing an essential portion of the low-noise structure of the soundproof type water-cooled engine generator according to the embodiment of the invention;

Fig. 2B is a plane view showing an essential portion of the low-noise structure of the soundproof type water-cooled engine generator according to the embodiment of the invention; and

Fig. 3 is a plane view showing the conventional low-noise structure of a soundproof type water-cooled engine generator.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

Fig. 1 is a perspective view showing a low-noise structure of a soundproof type water-cooled engine generator according to an embodiment of the present invention. Fig. 2A is an elevation showing an essential portion of the low-noise structure of the soundproof type water-cooled engine generator according to the embodiment of the invention. Fig. 2B is a plane view showing an essential portion of the low-noise structure of the soundproof type water-cooled engine generator according to the embodiment of the invention, and Fig. 3 is a plane view showing the conventional low-noise structure of a soundproof type water-cooled engine generator.

Hereafter, an embodiment of the invention will be described with reference to the drawings.

A soundproof bonnet 1, as shown in Fig. 1, accommodates a water-cooled engine 2 and a generator 3, both of which are directly connected so that they keep their axes aligned. In the lower portion of the soundproof bonnet 1, there is provided a base 4, on which the water-cooled engine 2 and the generator 3 are placed. Below the generator, a fuel tank 5 is located. An air inlet 6 is formed on each side wall of the soundproof bonnet 1. The air inlet 6 is located in the lower portion of each side wall. On the opposite side to the generator 3 of the water-cooled engine 2, a fan 7 is provided. A panel wall 8 stands nearby the fan 7 so that the fan 7 is located in the hole of the panel wall 8. The hole has the substantially same diameter as the fan 7. On the inner surface of the hole of the panel wall 8 (referred simply to as inlet), a guide 10 is secured. The guide 10 is formed to be projected toward the water-cooled engine 2. The part of the soundproof bonnet sectioned by the panel wall 8 functions as an engine and generator chamber 11, which accommodates the water-cooled engine 2, the generator 3, the fuel tank 5, a battery for starting the engine, and a control unit. The other sectioned part of the soundproof bonnet functions as an exhaust processing chamber 12.

In turn, the exhaust processing chamber 12 will be described in detail with reference to Figs. 1 and 2.

On the exhaust side of the fan 7, a radiator 13 stands along the lateral side of a shroud chamber 17 located inside of the exhaust air processing chamber 12. Around the inlet 9 of the panel wall 8, a hood-like encircling wall 14 is provided in a manner to guide the exhaust current from the fan 7 to the radiator 13. The radiator 13 is secured on the side of the encircling wall 14 by a bolt 15 in a manner to allow the radiator 13 to be completely fitted to the lateral opening of the wall 14. The wall 14 and the radiator 13 forms the shroud chamber 17. The outer wall of the shroud chamber and the inner surface of the exhaust processing chamber 12 form an exhaust duct chamber 18.

Under the exhaust processing chamber 12, a muffler 20 is located to extend along the width of the chamber 12. The muffler 20 is connected to one end of an exhaust pipe 21, the other of which is connected to an exhaust port of the water-cooled engine 2 in a manner to penetrate through the panel wall 8.

With the aforementioned construction, as shown in Figs. 1 and 2, the rotation of the fan 7 causes the outside air to be introduced into the air inlet 6, from which the air is entered into the engine and generator chamber 11 for cooling the engine 3, the water-cooled engine 2, the

fuel tank 5, the battery for starting the engine, and the control unit. The current of air then passes through the inlet 9 and the fan 7 and then is discharged to the shroud chamber 17. In this case, the clearance between the fan 7 and the inlet 9 is made as narrow as possible. This makes it possible to effectively send the heated current from the engine and generator chamber 11 to the shroud chamber 17.

The exhaust current, which has been sent to the shroud chamber 17 by the rotation of the fan 7 and heated in the chamber 11 as mentioned above, is guided along the inner surface of the encircling wall 14, that is, an L-like path and reaches the vertically-erected radiator 13. The exhaust current passes through the radiator 13 for cooling it. Then, the exhaust current is guided under the wall 14. The current passes along the wall surface 1a of the exhaust processing chamber 12. The exhaust current is guided upward along the exhaust pipe 21 as cooling the surface of the muffler 20 located in the lower of the exhaust processing chamber 12 and then reaches the exhaust duct chamber 18. Then, after the current of air serves to effectively cool the exhaust pipe 21 and the muffler exhaust pipe 25, the exhaust current is discharged to the outside through punched holes 22 of the outlet 23.

The heated exhaust air current sent to the shroud chamber 17 is guided along the inner surface of the encircling wall 14 so that the current of air changes its direction and passes along the path. Then, the heated current of air reaches the radiator 13 vertically standing against the lateral side of the shroud chamber 17. In this condition, the shroud chamber 17 is independently located to keep a predetermined distance from the radiator 13 standing upright. This locational arrangement results in greatly diminishing the current noise caused by the core.

Further, the encircling wall 14 independently formed inside of the exhaust processing chamber 12 has an effect on suppressing leakage of the noisy sound of the soundproof type water-cooled engine to the outside.

Moreover, the muffler 20 is located in the lower portion between the shroud chamber 17 and the exhaust processing chamber 12. This locational arrangement prevents the muffler 20 from being directly radiated to the radiator 13. This keeps the cooling efficiency of the radiator constant. Besides, since the current of air is discharged from the exhaust duct 18 as cooling the surface of the muffler 20, the soundproof materials located around the structure is not heated.

A check plate 16 located on the top of the encircling wall 14 is detachable because it is fastened by a bolt. Therefore, by removing only the upper part of the chamber 12, it is possible to check and clean the radiator 13.

As a result of measuring the heat balance and the noise of the engine constructed as above, it indicates that the internal temperature rise of about 5°C is allowed. As to noises, compared with the conventional structure in which the air noise occurs in the core of the radiator, it indicates that the noise of this embodiment is reduced by 3 dB(A). The noises are measured at the locations a, b, c and d, each of which keeps an interval of about 7 cm from the front, the rear or each side of the soundproof bonnet.

[Noise Data]

	a	b	c	d
	(front)	(left)	(right)	(rear)
Embodiment	65	65	62	63
Prior Art	67	68	65.5	66
			Unit dB(A)	

As set forth above, the low-noise structure of this invention is constructed so that the cooling fan is spaced from the radiator. In comparison with the conventional structure in which the cooling fan is located close to the radiator, the structure of this invention enables to reduce the air noises of the radiator.

Further, the engine and generator chamber is closed by the panel wall and the shroud chamber. The noises of the engine and generator chamber are temporarily cut off by the encircling wall, so that the noise leaked to the outside can be reduced.

The low-noise structure of this invention is constructed so that the radiator stands against the lateral side of the shroud chamber with the shorter side at the top. The exhaust current, therefore, collides against the encircling wall so that the current of air is guided along the lateral side. This makes it possible for the exhaust current to be evenly blown onto the overall surfaces and the peripheral portions of the radiator, thereby improving the cooling efficiency. This results in reducing the longitudinal dimension of the soundproof bonnet, which leads to overall reduction of the soundproof bonnet in size.

Moreover, the muffler is located at a distance from the radiator with the wrap wall laid therebetween. Hence, the direct radiation of the heat from the muffler does not lower the cooling efficiency of the radiator.

Claims

1. A soundproof type water-cooled engine generator having a water-cooled engine (2), a generator (3) to be driven by said water-cooled engine, a soundproof bonnet (1) accommodating said water-cooled engine and said generator and a cooling fan (7), said cooling fan causing a cooling current of air to be passed around said water-cooled engine and said generator and flowed through a radiator and then around a muffler, said soundproof type water-cooled engine generator characterized by comprising:

an engine and generator chamber (11) provided in said soundproof bonnet and for accommodating said engine and generator;
an exhaust processing chamber (12) provided in said soundproof bonnet and for accommodating said radiator and said muffler;
a panel wall (8) having an air vent (9) through which a cooling current of air sent by said cooling fan is passed and for partitioning said engine and generator chamber from said exhaust processing chamber, both of said chambers provided in said soundproof bonnet;
a radiator (13) provided to keep a predetermined angle with said panel wall so that said cooling current of air passed through said air vent changes direction before meeting said radiator;
a shroud chamber (17) provided in said exhaust processing chamber, for forming such a ventilation path as guiding said cooling current of air from said air vent to said radiator; and
a muffler (20) provided in said exhaust processing chamber in a manner to allow said cooling current of air from said radiator to pass around said muffler itself.

2. A soundproof type water-cooled engine generator according to claim 1, wherein said radiator provided in said exhaust processing chamber is vertically located in a manner to be crossed with said cooling fan substantially at right angles and said shroud chamber is formed like an L character to extend from said cooling fan to said radiator.

3. A soundproof type water-cooled engine generator according to claim 1, wherein said shroud chamber keeps a vertical positional relation with said muffler.

Patentansprüche

1. Schallgedämpfte, wassergekühlte Maschinen-Generator-Anlage, enthaltend eine wassergekühlte Brennkraftmaschine (2), einen von der wassergekühlten Brennkraftmaschine angetriebenen Generator (3), eine schallgedämmte Haube (1), in der die wassergekühlte Brennkraftmaschine und der Generator sowie ein Kühllüfter (7) untergebracht sind, der bewirkt, daß ein Kühlluftstrom rund um die wassergekühlte Brennkraftmaschine und den Generator sowie durch einen Radiator strömt und dann rund um einen Schalldämpfer, welche schallgedämpfte, wassergekühlte Maschinen-Generator-Anlage dadurch gekennzeichnet ist, daß sie enthält:

eine Maschinen- und Generatorkammer (11), die in der schalldichten Haube vorgesehen ist und die Brennkraftmaschine sowie den Generator aufnimmt;
eine Ausströmverarbeitungskammer (12), die in der schallgedämpften Haube vorgesehen ist und den Radiator sowie den Schalldämpfer aufnimmt;
eine Trennwand (8) mit einem Luftdurchlaß (9), durch den ein vom Kühllüfter angefachter Kühlluftstrom geleitet wird, zum Abtrennen der Maschinen- und Generatorkammer von der Ausströmverarbeitungskammer, wobei beide genannten Kammern in der schallgedämmten Haube vorgesehen sind;
einen Radiator (18), der gegenüber der Trennwand um einen vorbestimmten Winkel in einer solchen Weise versetzt angeordnet ist, daß der durch den Luftdurchlaß geleitete Kühlluftstrom vor dem Auftreffen auf dem Radiator seine Richtung ändert;
eine in der Ausströmverarbeitungskammer vorgesehene Abdeckkammer (17) zum Ausbilden einer solchen Strömungsbahn, daß der Kühlluftstrom von dem Luftdurchlaß zum Radiator geführt wird;
einen Schalldämpfer (20), der in der Ausströmverarbeitungskammer in einer solchen Weise vorgesehen ist, daß der Kühlluftstrom vom Radiator rund um den Schalldämpfer strömt.

2. Schallgedämpfte, wassergekühlte Maschinen-Generator-Anlage nach Anspruch 1, bei der der in der Ausströmverarbeitungskammer vorgesehene Radiator in einer solchen Weise vertikal angeordnet ist, daß er im wesentlichen rechtwinklig zum Kühllüfter ausgerichtet ist, und daß die vom Kühllüfter zum Radiator führende Abdeckkammer im wesentlichen eine L-förmige Gestalt hat.

3. Schallgedämpfte, wassergekühlte Maschinen-Generator-Anlage nach Anspruch 1, bei der die Abdeckkammer und der Schalldämpfer positionsmäßig in einer vertikalen Beziehung zueinander angeordnet sind.

Revendications

1. Générateur entraîné par moteur à refroidissement par eau du type insonorisé, comportant un moteur à refroidissement par eau (2), un générateur (3) devant être entraîné par ledit moteur à refroidissement par eau, un capot insonorisant (1) logeant ledit moteur à refroidissement par eau et ledit générateur et un ventilateur de refroidissement (7), ledit ventilateur de refroidissement amenant un écoulement d'air de refroidissement à passer autour dudit moteur à refroidissement par eau et dudit générateur et à s'écouler au travers d'un radiateur puis autour

d'un pot d'échappement, ledit générateur entraîné par moteur à refroidissement par eau du type insonorisé étant caractérisé en ce qu'il comprend :

une enceinte de moteur et de générateur (11) agencée dans ledit capot insonorisant et destinée à loger lesdits moteur et générateur,
une enceinte de traitement de l'échappement (12) agencée dans ledit capot insonorisant et destinée à loger ledit radiateur et ledit pot d'échappement,
une cloison (8) comportant un évent (9) au travers duquel passe un écoulement d'air de refroidissement engendré par ledit ventilateur de refroidissement et servant à séparer ladite enceinte de moteur et de générateur de ladite enceinte de traitement de l'échappement, lesdites chambres étant toutes deux situées dans ledit capot insonorisant,
un radiateur (13) disposé de façon à former un angle prédéterminé avec ladite cloison de façon que ledit écoulement d'air de refroidissement ayant franchi ledit évent change de direction avant de rencontrer ledit radiateur,
une enceinte de refoulement (17) disposée dans ladite enceinte de traitement de l'échappement, afin de former un trajet de ventilation tel qu'il guide ledit écoulement d'air de refroidissement depuis ledit évent jusqu'audit radiateur, et
un pot d'échappement (20) disposé dans ladite enceinte de traitement de l'échappement de manière à permettre audit écoulement d'air de refroidissement provenant dudit radiateur de passer autour dudit pot d'échappement lui-même.

2. Générateur entraîné par moteur à refroidissement par eau du type insonorisé selon la revendication 1, dans lequel ledit radiateur disposé dans ladite enceinte de traitement de l'échappement est disposé verticalement de manière à former sensiblement un angle droit avec ledit ventilateur de refroidissement, et dans lequel ladite enceinte de refoulement prend la forme d'une lettre L pour s'étendre depuis ledit ventilateur de refroidissement jusqu'audit radiateur.

3. Générateur entraîné par moteur à refroidissement par eau du type insonorisé selon la revendication 1, dans lequel ladite enceinte de refoulement est à la verticale dudit pot d'échappement.

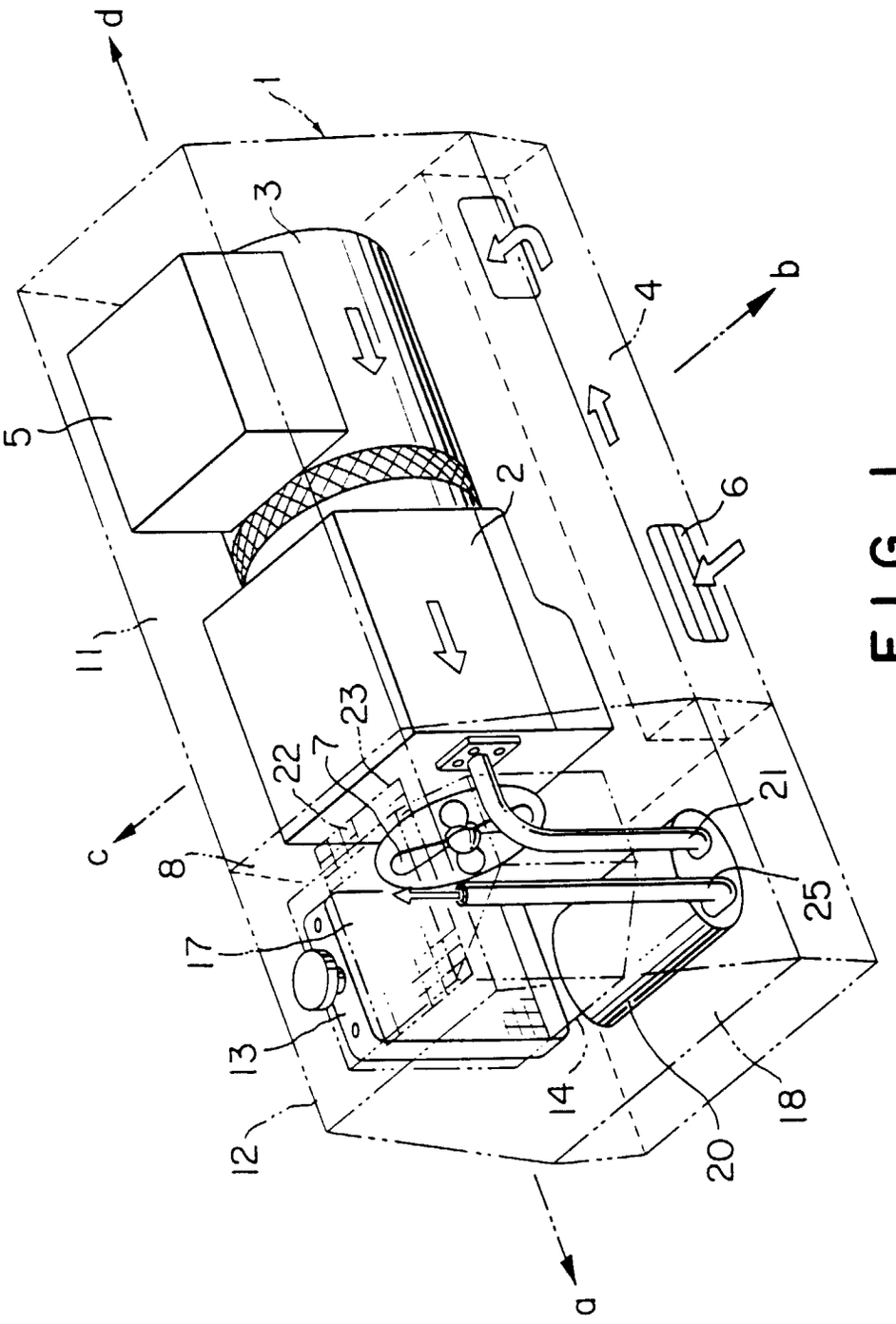

FIG. 1

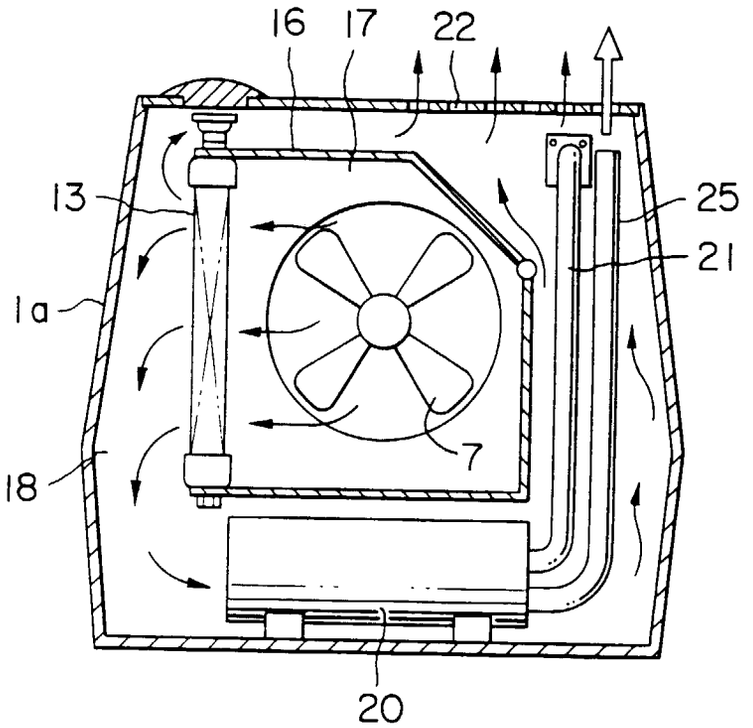

FIG. 2A

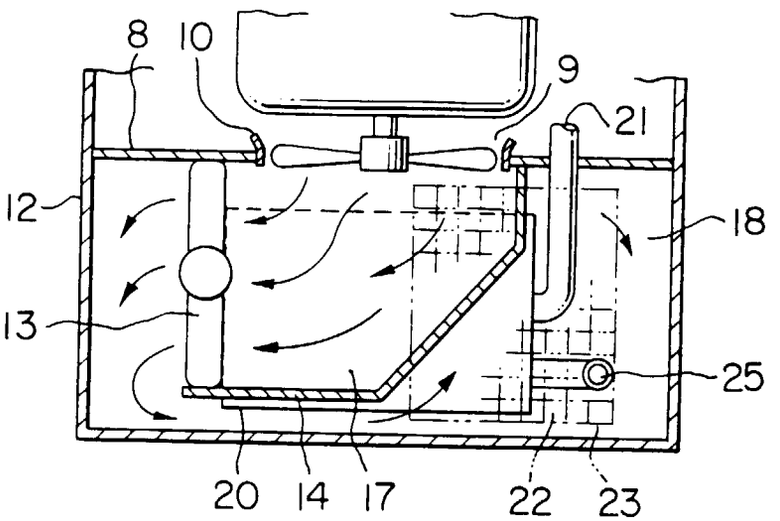

FIG. 2B

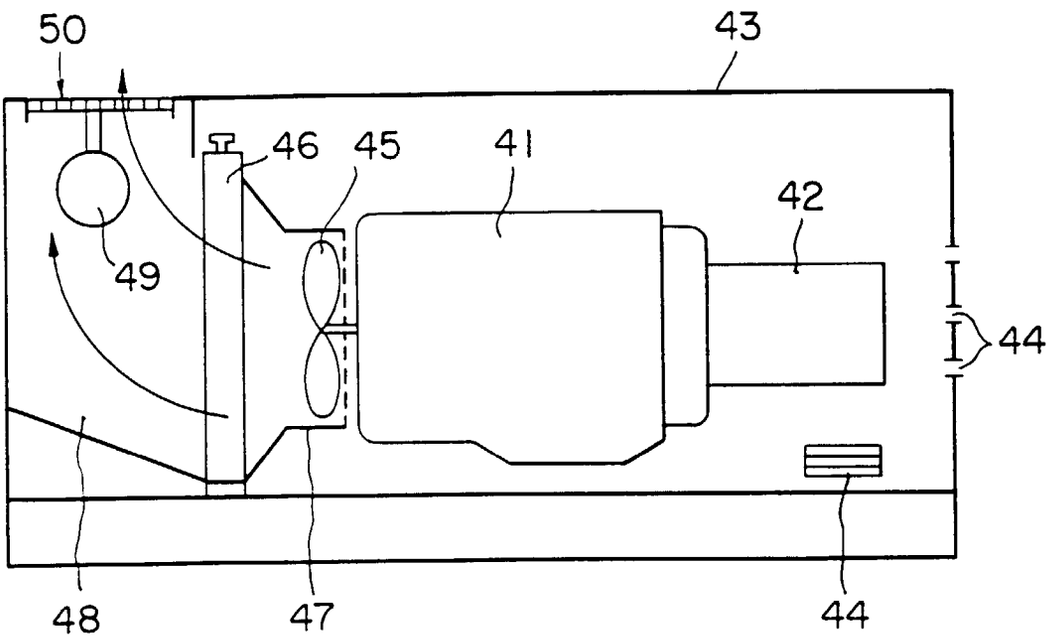

FIG. 3